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INSTRUCTION MANUAL

Ser # 6357

The RADA-SWEEP

KAY ELECTRIC COMPANY

14 Maple Ave., Pine Brook, N. J.

The Rada-Sweep

Section I. DESCRIPTION

The Rada-Sweep is a sweeping oscillator with crystal-positioned pip type frequency marks. The frequency modulated high frequency output and the pip type marks when used with a test circuit and an oscilloscope produce a display (frequency vs amplitude) of the pass band of the test circuit with certain designated frequencies indicated. The schematic of the Rada-Sweep appears as Figure 1.

Section II. FEATURES

The sweep system under discussion is all-electronic. The oscillator is frequency modulated by varying the permeability of the core of the oscillator coil. The sweep signal is a symmetrical sawtooth, the positive going portion being used to frequency modulate the high frequency output and the negative going portion to disable the oscillator and produce a bright zero level baseline on the oscilloscope display. The Rada-Sweep in its standard form has a sweep width of 20 mc and two center frequencies (30 mc and 60 mc) selectable by a front panel switch. In special models of the Rada-Sweep the front panel switch may select other center frequencies to a total greater than two.

All markers are crystal-positioned and of the pulse type, being fed directly to the vertical terminals of the oscilloscope. Markers of this type are completely independent of the circuit under test. They cannot cause overloading nor disappear in traps or regions of low amplification. The mark level is adjusted by an independent control which allows setting convenient mark heights regardless of the level of the frequency response display. The Rada-Sweep has standard marks at 25, 35, 55, 65 mc. These standard marks may be replaced by specially selected frequencies and up to five additional marks selected by the customer. All marks may be independently turned off or on by front panel switches.

The Rada-Sweep is carefully isolated from the electronically regulated power supply as well as from the power line source. A shield box completely encloses the high frequency unit independent of the cabinet.

Section III. GENERAL CIRCUIT DESCRIPTION

The basic circuits of the Rada-Sweep (schematic diagram Figure 1) are shown in the simplified block diagram in Figure 2. In addition to the regulated power supply, they are comprised of:

1. A triangular wave generator
2. A wide-band sweeping oscillator

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3. High-frequency output attenuator
4. Crystal-controlled mark circuit
5. Trigger amplifier
6. Pip generator

The triangular wave generator (V1 and V2 on Figures 1 and 2) generate and apply potentials which are used to frequency modulate the sweeping oscillator, sweep the time base of an auxiliary oscilloscope and produce the zero output trace which establishes a base line on the oscilloscope. The sweep voltage for application to the oscilloscope time base is made available at J1 in Figure 2. The frequency modulation of the oscillator (V3) is accomplished by developing a triangular wave of current in L1. The base line is established by disabling V3 through C44, R42 D1 and C23.

The sweeping oscillator operates at the fundamental frequency of the oscillator and employs a 12AT7 dual triode (V3). Utilizing a variable permeability technique, the oscillator is frequency modulated by means of an amplified triangular voltage wave generated in a 6J6 multivibrator circuit (V1). This triangular voltage wave is used not only to develop the frequency sweep but also to provide time-base sweep voltage for the horizontal axis of the oscilloscope. High frequency output from the sweeping oscillator is fed through a switched and variable attenuator and made available at the SWEEPING OSCILLATOR OUTPUT terminal (J2 in Figure 1 and 3) on the front panel. The output is coupled from the oscillator coil L3 into L2. The potential across L2 appears across R24, R25, and R27. R25 is the variable attenuator. The switched attenuator is comprised of S13, S14, S15 and R28 -----R36.

A portion of the sweep oscillator potential is applied to the crystal mark circuit - "Trigger" pulses are developed occurring at the time that the frequency of the sweep potential equals the frequency of the crystals in the crystal-mark circuits. These "Trigger" pulses are then amplified and fed to the "Pip" generator. The "Pip" generators supply sharp pulses, which mark specific frequencies, to the pip output terminals which are connected directly to the vertical input of the oscilloscope. R23 and crystals S1 through Xa comprise the crystal mark circuit. The "trigger" amplifier includes V5 and V6. The "pip" generator includes V7.

Section IV. DESCRIPTION OF CONTROLS

A. Panel Controls and Connectors

Controls

1. On-Off Toggle Switch (S12) is the power switch in the primary of the power transformer.
2. Pilot light (I1) is lighted when power is on.
3. The rotary switch in the center of the panel selects the desired center frequency of the sweep (S2 on Figure 1).

4. The knob marked "INCREASE" on the panel adjacent to the toggle switch mentioned in (5) below is the high frequency variable attenuator (R25 on Figure 1).
5. Toggle switches marked 20db, 20db, 10db comprise the switched attenuator (S13, S14, S15 on Figure 1).
6. The knob marked "INCREASE" and situated adjacent to the terminals marked "Pip Output" is the amplitude control of the "pip" markers. (R78 on Figure 1).
7. The toggle switches marked "Crystal Markers 1----9" turn each frequency mark on or off. The mark is off in the upward position of the switch and on in the downward position of the switch. (See S3 through S11 on Figure 1). See Appendix I for frequency of marks.
8. The rotary switch marked "SWEEP WIDE - NARROW" selects either a 20 mc or a 3 mc sweep width. See switch S1 on Figure 1.
9. The "Fine Tuning" control on the Rada-Sweep varies the center frequency of the narrow sweep but is inactive in the wide sweep. See R22 on Figure 1.
10. The knob marked "SWEEP RATE" adjusts the repetition rate of the triangular wave sweeping voltage. It is normally adjusted to synchronize the sweep to the line frequency as indicated by a steady pattern on the oscilloscope. By adjusting the sweep for asynchronous operation vertical motion of the pattern on the oscilloscope indicates hum in the test circuit or oscilloscope. See R2 on Figure 1.

CONNECTORS.

1. The output receptacle marked "Sweeping Oscillator Output" makes available the high frequency modulated output voltage. Impedance looking back into this receptacle is 70 ohms.
2. The terminals marked "PIP OUTPUT" furnish the crystal positioned marker pip voltage.
3. The terminals marked "SWEEP OUTPUT" make available the triangular wave voltage used for providing a time base on the oscilloscope.

B. CHASSIS CONTROLS (See Figure 4)

1. Marker adjustment R57 on Figure 1 is reached through a hole nearest the front panel on the right side of the cabinet (looking from front) and adjusts the input trigger level to the pip forming multivibrator when operating on the wide sweep. If this control is set too low some of the pips will disappear or perhaps no pips will appear. If the control is set too high the pip shapes become distorted, or multiple pips may be seen. The control should be set midway between the point where one or more pips disappear and when one or more pips becomes distorted or multiple.

2. Marker adjustment R58 on Figure 1 is reached through a hole to the rear on the right side of the cabinet looking from the front. This control operates in the same manner as R57 (See B1 above) except that it primarily affects the trigger adjustment for pips which appear when the front panel rotary switch (See A8 above) is set for narrow sweep output. Controls R57 and R58 interact to some extent and it may be necessary to reset them successively to obtain proper results.
3. Sweep Centering Adjustment (R13 on Figure 1) also adjusts sweep width. This potentiometer is reached through the hole on the left hand side of the cabinet (looking from the front). It may be used to readjust sweep width and centering whenever it is noted that the markers are located off center on the oscilloscope display.

Section V. OPERATING INSTRUCTIONS

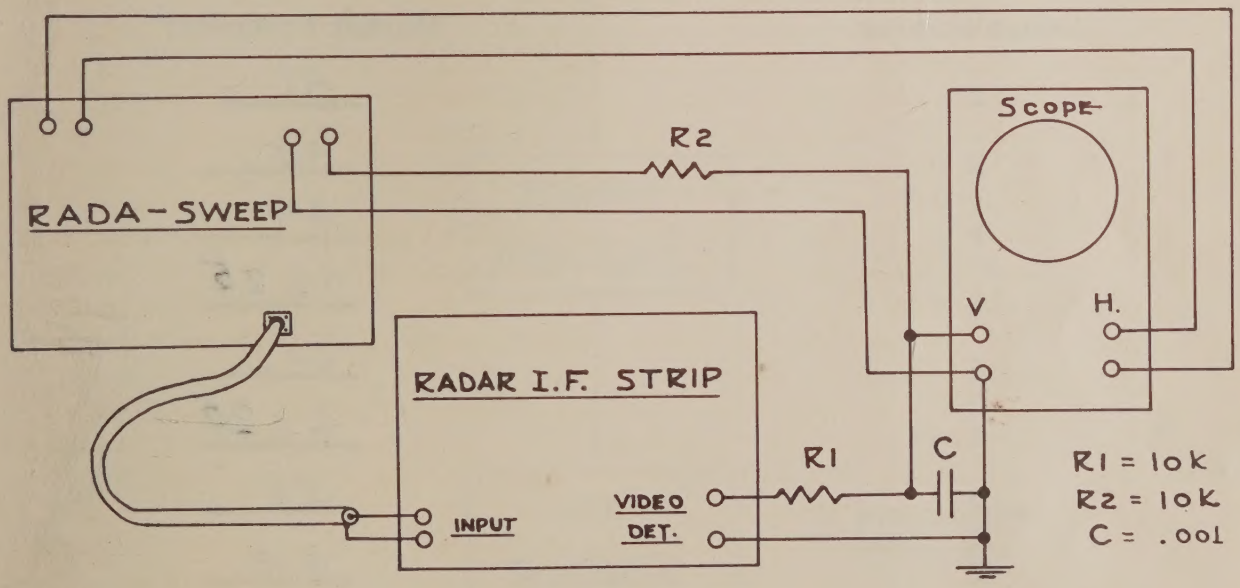
A. Plug the power cord into a source of 105-125 volts A.C. at 50-60 cycles, turn the instrument on, and allow a short warm-up period.

B. Make cable connections as follows (note sketch below):
   1. Connect supplied 70 ohm cable into "SWEEPING OSCILLATOR OUTPUT" receptacle on panel. Terminate the cable with a 70 ohm 1/2 watt resistor. Connect terminated cable to input of circuit to be tested.
   2. Connect "SWEEP OUTPUT" terminals to Horizontal input terminals of indicator oscilloscope. The horizontal sweep control of the oscilloscope should be switched to "amplifier" position disabling the internal oscilloscope sweep. Either shielded or unshielded cable may be used for this connection.
   3. Connect Pip Output terminals to vertical terminals of oscilloscope. Shielded lead is recommended. It may be found necessary to place an isolation resistor of approximately 10,000 ohms 1/2 watt in series with the lead right at the oscilloscope. The need for this isolation can be determined by observing the effect on the displayed response of connecting and disconnecting this pip output lead. Change in shape of response curve indicates desirability of isolation whereas the mere change in level is unimportant.
   4. Connect the detector output voltage to the vertical input of the oscilloscope through a filter network as shown below. Shielded cable is desirable here.

C. OPERATION
   1. Set the center frequency selector located in the center of the instrument panel to the desired center frequency.
   2. Adjust the attenuator switches and continuous control until typical response curve is displayed on the oscilloscope.
   3. Adjust the sweep rate control until oscilloscope pattern is stationary.

4. Adjust control beside Pip Output terminals until markers are of convenient height.

The instrument is now ready for use and will indicate overall response curve of circuit under test as well as marking location of selected frequencies on the response curve.



RADA-SWEEP CONNECTIONS

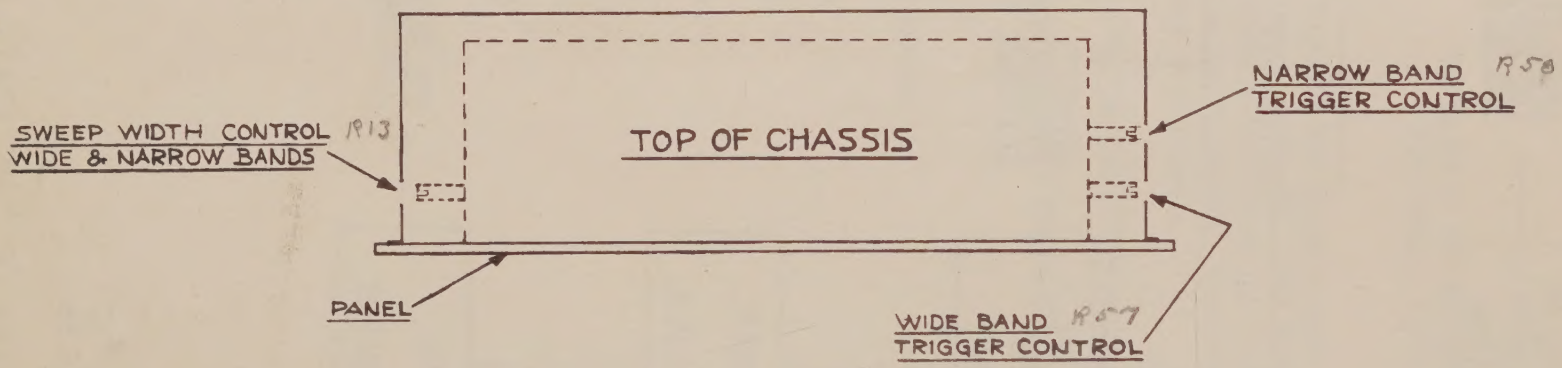
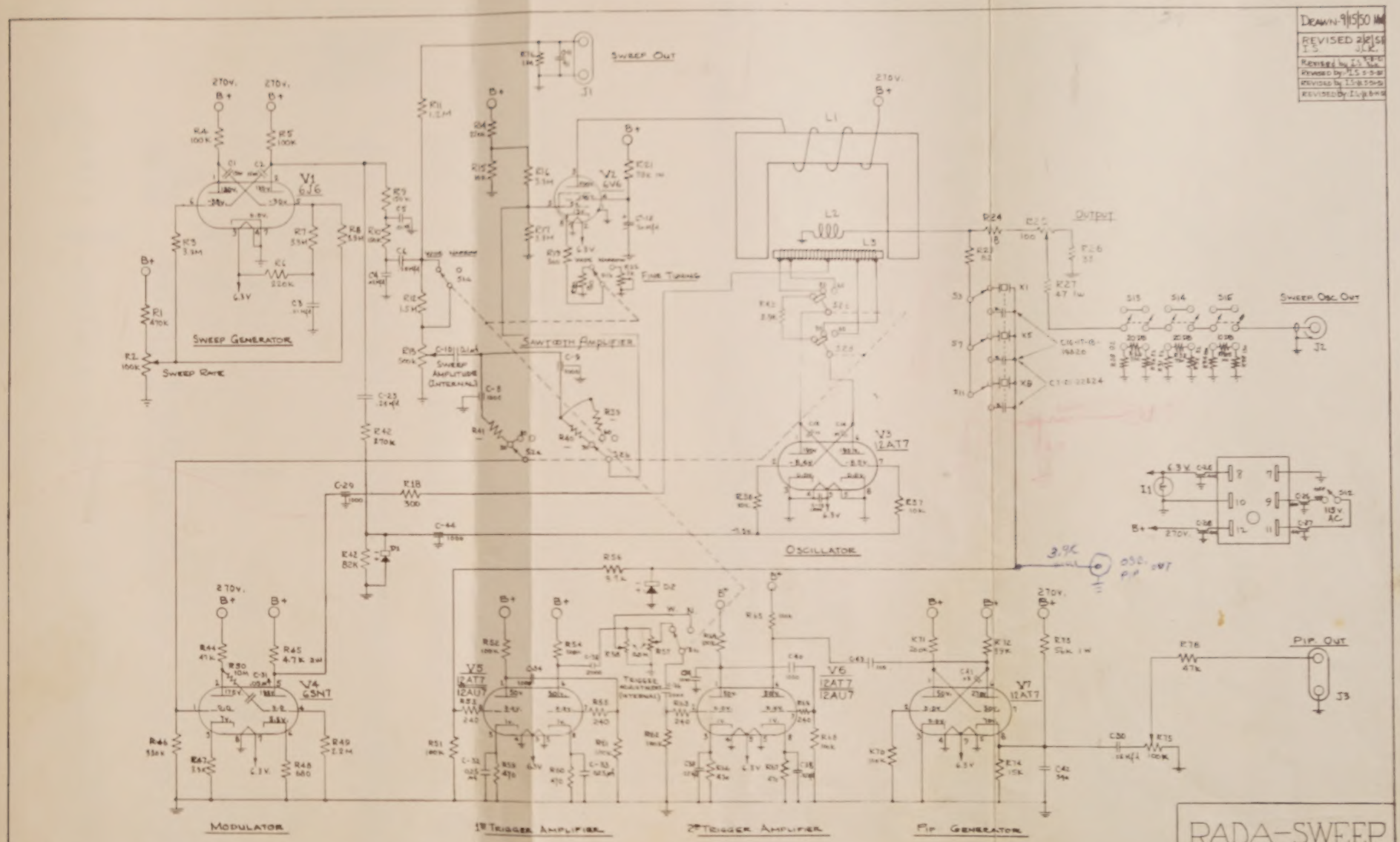


Fig. #4

SCREW DRIVER ADJUSTMENT CONTROLS OF THE RADA-SWEEP



NOTE:
ALL RESISTANCE VALUES IN OHMS; K=1,000, M=1,000,000
ALL CAPACITANCE VALUES IN MICROMICROFARADS; UNLESS OTHERWISE SPECIFIED

RADA-SWEEP

SCHEMATIC DIAGRAM
FIGURE NO 1
KAY ELECTRIC CO.
PINE BROOK, NJ

RADA SWEEP PANEL PARTS LIST

Tubes

V1	6J6	V5	12AT7 or 12AU7
V2	6V6	V6	12AT7 or 12AU7
V3	12AT7	V7	12AT7
V4	6SN7		

Resistors

All resistors 1/2 watt size unless specified

R1	470K	R37	82K
R2	100K - Pot. Sweep Rate	R38	47K
R3	3.3M	R39	4.7K 2 watt
R4	100K	R40	10M
R5	100K	R41	330K
R6	220K	R42	3.3K
R7	3.3M	R43	2.2M
R8	3.3M	R44	680 ohms
R9	150K	R45	100K
R10	150K	R46	240 ohms
R11	1.2M	R47	100K
R12	1.5M	R48	100K
R13	500K - Pot. Sweep	R49	240 ohms
R14	220K	R50	470 ohms
R15	10K	R51	470 ohms
R16	3.3M	R52	100K
R17	3.3M	R53	100K
R18	300 ohms	R54	500K) Pots. Trigger
R19	300 ohms	R55	500K) Adj. (Internal)
R20	180 ohms	R56	3.9K
R21	33K 1 watt	R57	100K
R22	3K	R58	100K
R23	100 ohms	R59	240 ohms
R24	18 ohms	R60	470 ohms
R25	100 ohms	R61	470 ohms
R26	500 ohms) Dual Pot	R62	100K
R27	250 ohms) Output	R63	240 ohms
R28	100 ohms	R64	100 K
R29	3.9K	R65	200K
R30	10K	R66	39K
R31	10K	R67	56K 1 watt
R32	Various values used	R68	15K
R33	Various values used	R69	100K
R34	Various values used	R70	47K
R35	270K	R71	82 ohms
R36	300 ohms	R72	330 ohms

RADA SWEEP PANEL PARTS LIST (CONT)

Resistors (Cont)

R73	330 ohms	R77	82 ohms
R74	100 ohms	R78	130 ohms
R75	82 ohms	R79	130 ohms
R76	82 ohms	R80	1M

Capacitors

C1	1500 mmf	-500 V	C23	2mmf -500 V
C2	1500 mmf	-500 V	C24	2 mmf -500 V
C3	.01 mf	-500 V	C25	400 mmf -500 V
C4	.02 mf	-400 V	C26	400 mmf -500 V
C5	.01 mf	-500 V	C27	400 mmf -500 V
C6	0.25 mf	-200 V	C28	400 mmf -500 V
C7	0.25 mf	-500 V	C29	1000 mmf -500 V
C8	1000 mmf		C30	91 mmf -500 V
C9	1000 mmf		C31	.05 mf -400 V
C10	0.1 mf		C32	0.25 mf -200 V
C11	91 mmf	-500 V	C33	0.25 mf -200 V
C12	20 mf	-450 V Electro	C34	1000 mmf -500 V
C13	10 mmf	-500 V	C35	2000 mmf -500 V
C14	10 mmf	-500 V	C36	2000 mmf -500 V
C15	1000 mmf	-500 V	C37	1000 mmf -500 V
C16	2 mmf	-500 V	C38	0.25 mf -200 V
C17	2 mmf	-500 V	C39	0.25 mf -200 V
C18	2 mmf	-500 V	C40	1000 mmf -500 V
C19	2 mmf	-500 V	C41	33 mmf -500 V
C20	2 mmf	-500 V	C42	390 mmf -500 V
C21	2 mmf	-500 V	C43	100 mmf -500 V
C22	2 mmf	-500 V	C44	1000 mmf -500 V

Coils

L1	Primary
L2	Pickup
L3	Secondary

Note: Solid core used on pickup coil

Crystals

X1 - X9	Markers	Quartz
D1	1N34	Germanium
D2	1N34	Germanium

Connectors

J1	General Radio	SWEEP OUT
J2	B.N.C.	SWEEP OSC. OUT.
J3	General Radio	PIP OUT

RADA SWEEP
PANEL
PARTS LIST (CONT)

Switches		
S1 a, b, c, d	Rotary	BAND SELECTOR
S2 a, b, c, d	Rotary	SWEEP WIDTH
S3 - S11	S.P.D.T.	MARKERS
S12	S.P.S.T.	ON - OFF
S13	D.P.D.T.	20DB
S14	D.P.D.T.	20DB
S15	D.P.D.T.	10DB
Fuse		
F1	3 amp.	
Pilot Lamp		
I1	#47	Bayonet Type

POWER SUPPLY
PARTS LIST

Tubes			
V1	5Y3		
V2	6Y6		
V3	6SL7		
V4	VR150		
Resistors			
R1	330,000 ohms		1 Watt
R2	100 "		
R3	100 "		
R4	27,000 "		
R5	47,000 "		
R6	22,000 "		5 Watt
R7	25,000 "		Pot. Output voltage control
R8	56,000 "		

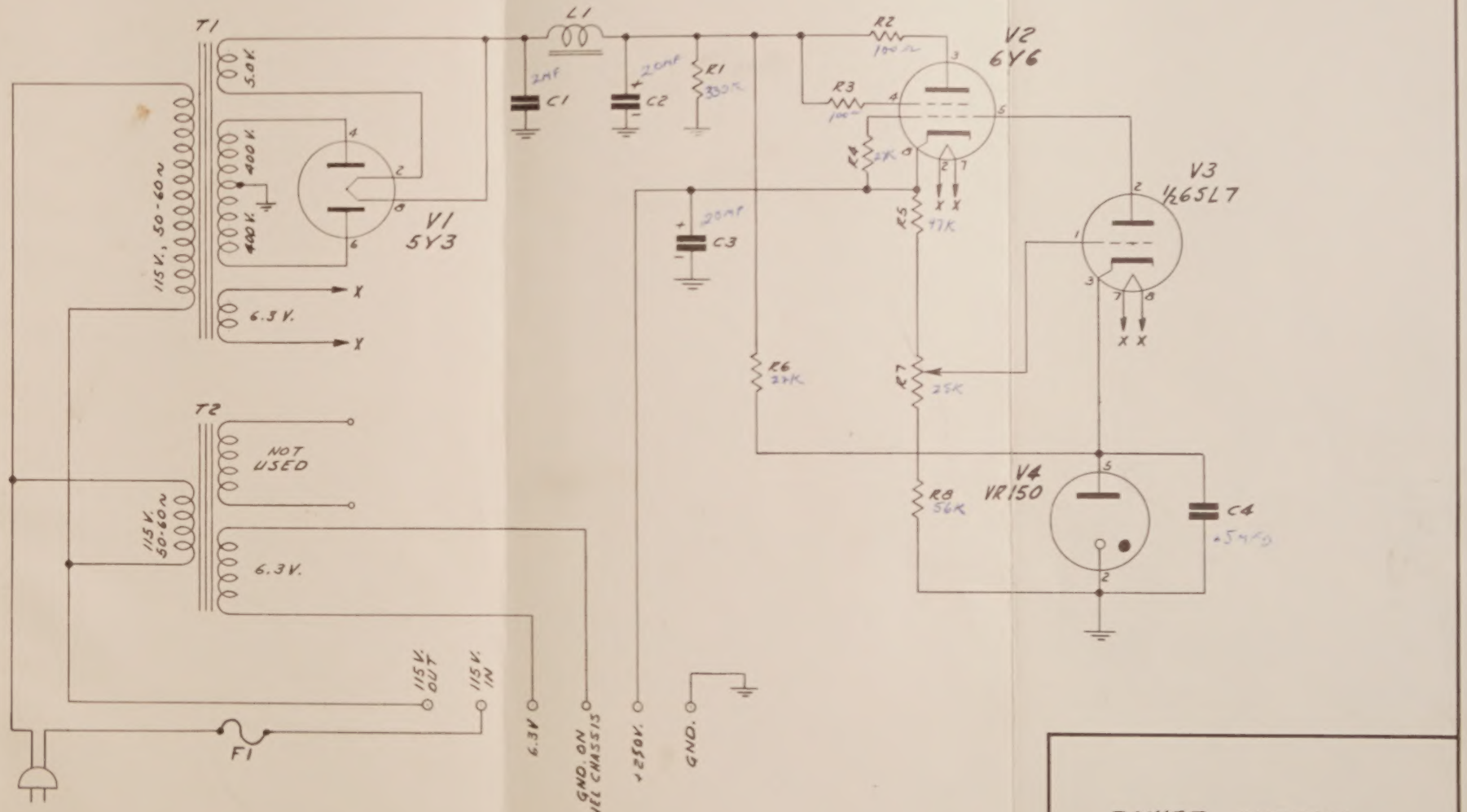
All resistors 1/2 watt unless otherwise specified.

Condensers			
C1	2 mf.	600 v.	Paper
C2	20 mf.	450 v.	Electrolytic
C3	20 mf.	450 v.	Electrolytic
C4	0.5 mf.	600 v.	Paper

Transformers	
T1	Power (115 volt pri.; 400-400 v., 5 v., 6.3 v. sec.)
T2	Filament (115 volt pri.; 6.3 v. sec.)

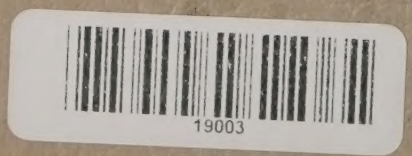
Coils		
L1	10 H.	Iron core choke

Fuse	
F1	5 amps.



POWER SUPPLY

KAY ELECTRIC CO. PINE BROOK, N.J.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